Proceedings of the 7th International Conference on Functional-Structural Plant Models, Saariselkä, Finland, 9 - 14 June 2013. Eds. Risto Sievänen, Eero Nikinmaa, Christophe Godin, Anna Lintunen & Pekka Nygren. http://www.metla.fi/fspm2013/proceedings. ISBN 978-951-651-408-9.

Parameterisation and evaluation of stand level process-based PipeQual-model for Norway spruce

Tuomo Kalliokoski[1,2], Harri Mäkinen[2] and **Annikki Mäkelä[1]**
[1]*Department of Forest Sciences, P.O. Box 27, 00014 University of Helsinki, Finland*
[2]*Finnish Forest Research Institute, Vantaa Research Unit, P.O. Box 18, 01301 Vantaa, Finland*
**correspondence:* tuomo.kalliokoski@metla.fi

Highlights: We evaluated the process-based stand growth mode, PipeQual, with the data from the long-term experiments. Slope values between observations and simulations ranged from 0.96 to 1.05 depending on the variable illustrating the applicability of PipeQual for predicting forest stand growth in the future climate.

Keywords: *Picea abies*, growth simulation model, validation

Process-based simulation models provide means for depicting the growth and development of the forest stands in the future climate. The premise of predicting forest growth in future climate is that the model produces consistent results with the observed forests growth in past and current climate. In this study, we parameterisized and evaluated the PipeQual model using dataset collected from 19 long-term thinning experiments in even-aged Norway spruce (*Picea abies* L. Karst) stands in southern and central Finland. PipeQual model is a process-based carbon balance model, in which stand is divided to size classes. Within each class mean tree acquires carbon and allocates it to foliage, branches, stem and roots based on structural regulations. The growth of each size class is described by this mean tree and the number of trees in the class. To ensure observed flexibility of Norway spruce crown structure, the built-in empirical relationships between needle mass and crown length, and between branch and crown length were made dependent of light environment. Due to these modifications, tree crowns grow denser in more intense light and wider with lower crown coverage. After these modifications, the model accuracy at the whole dataset level was high, slope values between observations and simulations ranging from 0.96 to 1.05 depending on the variable. The predicted mortality of trees was slightly higher than observed in a few cases. The average bias in stand dominant height was 0.44 m, 0.77 cm in stand mean diameter, 3.1 m^2 in stand basal area and 22 m^3 in stand total stem volume. Stand dynamics over time also followed generally quite closely the observed patterns (Fig. 1). Reasonable accurate predictions illustrate the applicability of PipeQual model for predicting forest stand growth in the future climate.

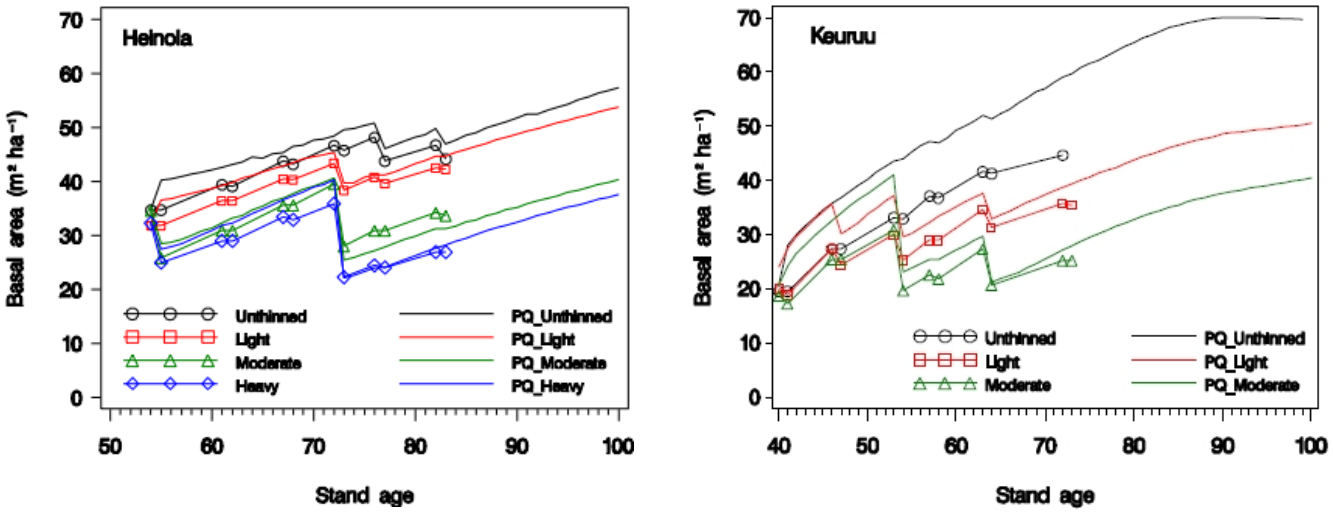

Fig. 1. Stand basal area plotted against stand age in two different experiments with plots of varying thinning intensity. Lines with the markers are the observations, lines without markers are the predictions of PipeQual model.